REMARKS

This amendment is responsive to the Office Action mailed October 31, 2007. Claims 61, 65-70, 72-76, and 84-99 were pending and under consideration. No claims are amended, cancelled, or newly presented for consideration in the present paper. Thus, claims 61, 65-70, 72-76, and 84-99 remain pending and under consideration.

Applicants acknowledge with appreciation the PTO's recognition that the instant claims are entitled to benefit of the filing date of International Patent Application No. PCT/US04/10946, April 15, 2004, and kindly thank the PTO for the same. Applicants further thank the PTO for the withdrawal of the previously outstanding rejections under 35 U.S.C. §§ 102(b) and 112, first paragraph.

I. The Rejection of Claims 61, 65-70, 72-76, and 84-99 as Obvious Should Be Withdrawn

Claims 61, 65-70, 72-76, and 84-99 stand rejected under 35 U.S.C. § 103(a) as allegedly obvious over Shachter, 2001, *Curr. Opin. Lipidol.* 12:297-304 ("Shachter") in view of GenBank Accession No. NT_035088, Jong *et al.*, 1999, *Ateriosclerr. Thromb. Vasc. Biol.* 19:472-484 ("Jong"), Senior, 2002, *Drug Discov. Today* 7:840-1 ("Senior") and Monia *et al.*, U.S. Patent No. 6,300,132 ("Monia").

In particular, the PTO contends that Shachter teaches that variation in apolipoprotein C-III expression affects hypertriglyceridemia and that apolipoprotein C-III has an important role in elevating plasma triglyceride concentrations. The PTO acknowledges that Shachter does not teach an administration of an antisense compound that specifically hybridizes with a nucleic acid encoding apolipoprotein C-III (SEQ ID NO:4).

The PTO also contends that Senior teaches antisense inhibitors as effective treatment approaches for hypercholesterolemia, and that antisense compounds can be delivered *in vivo* in a mouse model of hypercholesterolemia to decrease plasma triglyceride concentrations. As discussed below, however, Senior teaches use of antisense compounds to decrease expression of apolipoprotein B, which encodes a substantially different gene product from apolipoprotein C-III.

The PTO further contends that Jong teaches that apolipoprotein Cs have distinct effects on the major metabolic pathways and implies that changes in human apolipoprotein C expression may play a role in the etiology of human hyperlipidemias.

The PTO also cites Monia as teaching administration of antisense oligonucleotides, including chemically modified oligonucleotides, and contends that Monia provides a detailed

blueprint for how to make and use inhibitory antisense oligonucleotides to target any known gene.

The PTO also notes that GenBank Accession No. NT_035088 teaches a nucleic acid sequence encoding apolipoprotein C-III as recited by SEQ ID NO:4.

Applicants respectfully submit that none of the cited references, either alone or in combination, suggests to the artisan of ordinary skill that antisense compounds 100% complementary to SEQ ID NO:4 should be used in methods for ameliorating hepatic stenosis or lowering liver tissue triglyceride levels in an animal, and certainly fail to provide a reasonable expectation that such methods would succeed. Specifically, none of the cited references provide a reason that an antisense compound that specifically binds SEQ ID NO:4, *i.e.*, a nucleic acid encoding apolipoprotein C-III, should be used in the claimed methods. Moreover, none of the cited references suggest to one of ordinary skill in the art that reduction of apolipoprotein C-III expression might result in amelioration of hepatic stenosis or reduced liver triglyceride levels. Further, merely because apolipoprotein B expression can affect lipid metabolism in no way provides a reasonable expectation that decreasing expression of a substantially different gene, apolipoprotein C-III, can achieve the claimed methods. Thus, the presently claimed methods for ameliorating hepatic stenosis or lowering liver tissue triglyceride levels are not obvious in view of the cited references whether considered alone or in combination.

A. <u>The Legal Standard</u>

The Supreme Court's decision in *Graham* v. *John Deere Co. of Kansas City*, 383 U.S. 1 (1966) sets forth the controlling standard for assessing purported obviousness of a claimed invention: "[T]he scope and content of the prior art are ... determined; differences between the prior art and the claims at issue are ... ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined." *See id.* at 17–18.

The Supreme Court's recent decision in *KSR. Int'l Co. v. Teleflex*, 127 S.Ct. 1727, (2007) provides guidance regarding exactly how the differences between the prior art and claimed invention are analyzed to assess the obviousness or non-obviousness of the claims. As the Supreme Court explained, "interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art" can all be assessed "to

determine whether there was an apparent reason to combine the known elements" as recited by the claim at issue. *See id.* at 1731. The Supreme Court expressly cautioned that this reason should be explicitly stated. *See id.* Thus, the PTO must identify an explicit reason to combine the elements of the prior art in the manner defined by the claims at issue. *See Takeda Chemical Industries, LTD v. Alphapharm Pty, Ltd.*, 83 USPQ2d 1169 (Fed. Cir. 2007).

Moreover, the *KSR* Court provides some guidance regarding when a particular combination of elements that may be "obvious to try" can be legally obvious under § 103(a). "When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success," a claim directed to the combination that would be "obvious to try *might* [be] obvious under § 103." *See id.* at 1742 (emphasis supplied). Thus, the availability of numerous possible solutions to a market problem where each such solution yields unpredictable results suggests that a claim directed to one such solution is in fact *not* obvious. This situation is particularly relevant to the pharmaceutical arts, which have been repeatedly are acknowledged as unpredictable. *See, e.g., In re Chupp*, 2 USPQ2d 1437 (Fed.Cir. 1986), *Takeda Chemical Industries, LTD v. Alphapharm Pty, Ltd.*, 83 USPQ2d 1169 (Fed. Cir. 2007) and *Eli Lilly and Co. v. Zenith Goldline Pharmaceuticals, Inc.*, 81 USPQ2d (Fed. Cir. 2006).

Finally, the *KSR* Court explained that the Federal Circuit's so-called "Teaching-Suggestion-Motivation" test could in some cases be used to show obviousness of a claimed invention. *See KSR*, 127 S.Ct. at 1741. One part of this test requires that the prior art references cited by the PTO must suggest to one of ordinary skill in the art that the invention would have a reasonable expectation of success. *See In re Dow Chemical*, 5 U.S.P.Q.2d 1529 (Fed. Cir. 1988). The expectation of success must come from the prior art, not the applicant's disclosure. *See id.* If the prior art fails to provide such a reasonable expectation of success, the claimed invention is not *prima facie* obvious.

B. The Cited References Do Not Suggest a Method for Ameliorating Hepatic Stenosis or Lowering Liver Tissue Triglyceride Levels with an Antisense Compound 100% Complementary to an Apolipoprotein C-III-Encoding Sequence

The references cited by the PTO, whether considered alone or in combination, provide no reason to one of ordinary skill in the art to use an antisense compound 100% complementary to SEQ ID NO:4 in the methods as presently claimed. Shachter is a review

article that, *inter alia*, generally discusses the purported role of apolipoprotein C-III in lipid metabolism. Shachter discloses evidence that variation in apolipoprotein C-III expression may play a role in hyperlipidemia. *See* Shachter at abstract. Shachter *et al.* also teaches that certain drugs that can result in reduced triglyceride levels (*e.g.*, the fibrate class of drugs and certain statins) can also result in decreased apolipoprotein C-III expression. *See* Shachter, paragraph bridging pp. 298-9. Nowhere, however, does Shachter even remotely suggest that apolipoprotein C-III may play a role in hepatic stenosis or lowering liver tissue triglyceride levels.

Rather, Shachter focuses on the effects of apolipoprotein C-III expression on *plasma* triglyceride concentrations. *See*, *e.g.*, Shachter, p. 298, col. 1, second full paragraph. Thus, whatever Shachter might teach about the relationship between apolipoprotein C-III expression and plasma triglyceride levels, Shachter teaches nothing regarding expression of apolipoprotein C-III and *liver* triglyceride levels, and surely fails to suggest that reduced expression of apolipoprotein C-III might ameliorate hepatic stenosis.

Moreover, even assuming *arguendo* that plasma triglyceride levels are relevant to liver triglyceride levels, Shachter specifically cautions that the effects of drugs that cannot be unequivocally attributed to reduced apolipoprotein C-III expression. In particular, Shachter states that "questions have been raised regarding the importance of the apoC-III effects of fibrates in diabetic dyslipidemia. In this regard, recent work in a mouse model of diabetic dyslipidemia found only a modest increase in apoC-III, which would be unlikely to be an important contributor to the dyslipidemic phenotype." *See* Shachter, paragraph bridging pp. 298-9.

Shachter also notes that statins' triglyceride-lowering properties may be partially mediated by reduced apolipoprotein C-III expression, but notes that the mechanism remains uncertain and provides no positive statements suggesting that this link has been proven. *See id.* At best, therefore, Shachter teaches that drugs that can achieve reduced triglyceride concentrations can also modulate apolipoprotein C-III expression. Shachter thus fails to teach any direct causative link between reducing apolipoprotein C-III expression with *any* therapeutic agent, let alone antisense agents, and reducing plasma triglyceride concentrations. Thus, even if plasma triglyceride concentrations are relevant to liver triglyceride levels, Shachter still fails to teach or suggest that reducing apolipoprotein C-III expression would result in reduced liver triglyceride concentrations.

Similarly, Jong is another review article that discusses the roles of the various apolipoprotein C genes and gene products and their effects on lipoprotein metabolism. While Jong indicates that the apolipoprotein C family indeed plays a role on lipoprotein metabolism

and on, for example, plasma triglyceride levels, nowhere does Jong teach or suggest that reducing apolipoprotein C-III expression could ameliorate hepatic stenosis or reduce liver triglyceride concentrations.

It should also be noted that Jong, like Shachter, equivocates even when discussing any purported causative link between apolipoprotein C-III expression and plasma triglyceride concentrations. For example, Jong indicates that "structural mutations in the human *APOC3* gene fail to clearly show an association between the mutation and an altered lipid/lipoprotein metabolism." *See* Jong, paragraph bridging pp. 473-4. Ultimately, Jong concludes that the mechanisms underlying the effects of apolipoprotein C-III on triglyceride concentrations are complex and unknown. *See* Jong, p. 474, col. 2, first and third full paragraphs. Thus, nowhere Jong does teach or suggest that simple reduction of apolipoprotein C-III expression can result in reduced *plasma* triglyceride levels, let alone ameliorate hepatic stenosis or reduce *liver* triglyceride concentrations. As such, Jong, either alone or in combination with also fails to teach or suggest the instantly claimed methods.

Senior cannot remedy the deficiencies of Shachter and Jong. Senior merely discloses that antisense compounds that specifically hybridize to *apolipoprotein B* can reduce hypercholesterolemia in a mouse model. Nothing in Senior suggests to the artisan of ordinary skill that antisense compounds 100% complementary to *apolipoprotein C-III* could achieve reduced triglyceride concentrations, and surely not ameliorate hepatic stenosis or reduce liver triglyceride levels. Although both are involved in lipid metabolism, apolipoprotein B and apolipoprotein C-III are distinct genes, encoding different proteins with very different biological activities.

Apolipoprotein B is a constituent of LDL cholesterol and thus plays a direct role in plasma cholesterol and triglyceride concentrations. *See*, *e.g.*, Senior at p. 840, col. 1, paragraph 1. Apolipoprotein C-III, in contrast, is a regulatory protein that modulates lipid metabolism by inhibiting plasma lipase, reducing VLDL particle adherence to the cell surface glycosaminoglycosan matrix, and reducing remnant LDL particle clearance. *See* Shachter paragraph bridging pp. 297-8. Thus, Senior's teaching that antisense compounds that specifically hybridize to apolipoprotein B effectively reduce plasma cholesterol concentrations fails to suggest to one of ordinary skill in the art that antisense compounds 100% complementary to apolipoprotein C-III would be useful to ameliorate hepatic stenosis or reduce liver triglyceride concentrations. As such, Senior, even in combination with Shachter and Jong, fails to teach or suggest the instantly-claimed methods.

With respect to Monia, even assuming that Monia provides a "blueprint" for reducing expression of a target gene with antisense oligonucleotides, Monia teaches nothing regarding

the effects of apolipoprotein C-III expression on hepatic stenosis or liver triglyceride concentrations. As such, Monia fails to remedy the deficiencies of Shachter, Jung, and Senior discussed above.

With respect to GenBank Accession No. NT_035088, Applicants note that this citation is used merely to point out the nucleic acid sequence encoding human apolipoprotein C-III protein and thus provides no teaching regarding reduction of cholesterol or triglyceride concentration, treatment or delay of hypertriglyceridemia, or therapeutic modulation of apolipoprotein C-III expression. As such, combining GenBank Accession No. NT_035088 with the remaining references in no way cures the deficiencies discussed above.

Moreover, the teachings of Senior, Jung, Shachter, Monia, and GenBank Accession No. NT_035088, even in combination, fail to provide an artisan of ordinary skill with a reasonable expectation of practicing the claimed methods. As discussed extensively above, Shachter and Jong merely indicate that apolipoprotein C-III plays a role in lipid metabolism and fails to teach even a single link between reducing apolipoprotein C-III expression and ameliorating hepatic stenosis or reducing liver triglyceride levels, while Senior discusses antisense modulation of apolipoprotein B, a completely different gene product. In view of these deficiencies coupled with the complete lack of guidance in the cited references regarding, for example, selection of a therapeutic, let alone an antisense compound 100% complementary to SEQ ID NO:4, for use in treating the recited disorders, the combination of cited references certainly fails to provide a reasonable expectation of successfully practicing the claimed methods.

Further, even assuming *arguendo* that the PTO could establish that the cited combination of references might make it "obvious to try" to use compounds that work to reduce expression of apolipoprotein C-III (such as an antisense compound 100% complementary to SEQ ID NO:4) in methods for ameliorating hepatic stenosis or reducing livery triglyceride concentrations, the Supreme Court's language in *KSR* forecloses any conclusion of obviousness for the methods as presently claimed. More particularly, assuming *arguendo* that Shachter or Jong might teach that decreasing expression of apolipoprotein C-III might be effective in such methods, none of the cited references, either alone or in combination, teaches or suggests that *antisense compounds* complementary to SEQ ID NO:4 as opposed to any other available strategy should be used in the methods.

One of ordinary skill in the art would regard antisense technology as one of any number of options having unpredictable results to choose from when deciding on methods for ameliorating hepatic stenosis or reducing liver triglyceride levels. For example, as extensively discussed in Shachter, the members of the fibrate class of drugs (including at

least two approved known compounds and an unknown number of possibly effective related compounds) and the statins (including at least ten FDA approved compounds and an unknown number of possibly effective related compounds) are options for use in methods for treating hyperlipidemia. *See* Shachter, paragraph bridging p. 298 and 299 and the Physician's Desk Reference, 2005, page 207, under the headings Fibric Acid Derivatives and HMG-CoA Reductase Inhibitors, attached hereto as Exhibit A.

In addition to these classes of drugs, the Physician's Desk References discloses five additional drugs for treatment of hyperlipidemia from three additional classes. *See id.* Further, other strategies for reducing apolipoprotein C-III activity or expression are available to those of ordinary skill in the art, including strategies designed to specifically inhibit apolipoprotein C-III activity (*e.g.*, identifying small molecule or immunoglobulin inhibitors of apolipoprotein C-III) or reduce expression of apolipoprotein C-III (identifying and modulating upstream regulators other than those presently identified; gene replacement techniques to alter regulatory regions, *etc.*) Any of these strategies might be chosen by the ordinarily-skilled artisan to try in methods for ameliorating hepatic stenosis or reducing liver triglyceride levels. Alternately, other targets, including other apolipoprotein targets, might be selected for antisense inhibition to try to achieve the claimed methods. In either case, the ordinarily-skilled artisan could not predict which, if any, of these strategies might ultimately result in successful amelioration of hepatic stenosis or reduction of liver triglyceride levels

From these myriad, unpredictable options, Applicants have identified particular compounds, antisense compounds 100% complementary to SEQ ID NO:4, that effectively ameliorate hepatic stenosis and/or reduce liver triglyceride levels in an *in vivo*, art-recognized model. As such, even assuming *arguendo* that it might be "obvious to try" to use antisense compounds 100% complementary to SEQ ID NO:4 in methods to ameliorate hepatic stenosis or reduce liver triglyceride levels, the presently claimed methods cannot be found legally obvious.

C. <u>The Obviousness Rejection Should Be Withdrawn</u>

Applicants respectfully submit that the PTO has failed to articulate a reason why the artisan of ordinary skill should modify the cited references, either alone or in combination, to achieve the invention as presently claimed. Further, Applicants respectfully submit that such an ordinarily-skilled artisan could not predict the effectiveness of the claimed methods in view of the general guidance provided by the cited references. As such, Applicants respectfully submit that claims 61 and 70, and each of the claims depending therefrom, are

not obvious over the references cited by the PTO. Therefore, Applicants respectfully request that the rejection of claims 61 and 70 under 35 U.S.C. § 103(a) as allegedly obvious over Shachter in view of Jong, Senior, Monia, and GenBank Accession No. NT_035088. be withdrawn.

III. Conclusion

In light of the above amendments and remarks, the Applicant respectfully requests that the PTO reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney at (650) 739-3949, if a telephone call could help resolve any remaining items.

Respectfully submitted,

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